Qwest Foundation for Education
Competitive Sub-grant Application Assurance Sheet

Project Title: Three Phase Science Curriculum Improvement Amount of Request: $9987.40

District Name: Salmon School District Number: 291

Name of Certificated Teacher: Tracy Burgess, Renae Lewis, and Arlene Wolf

Name of School currently teaching at: Salmon High School

Years taught in Idaho K-12 public education: twelve, thirteen, and twenty-two

Content area(s) that you are teaching in Idaho K-12 public education: Natural Science, Biological Science, and Standard Mathematics (6-12)

I certify that if I receive a Qwest Foundation for Education Grant –

- **I agree to be videotaped teaching a technology-based lesson for purposes of sharing best practices with other Idaho K-12 teachers.**
- **I agree to do one presentation on technology integration to other Idaho K-12 teachers before October 31, 2008.**

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CURRENT USE OF TECHNOLOGY IN CLASSROOM

At Salmon High School over the past three years, we have been able to increase our use of technology within the science department, through the purchase of basic, updated scientific equipment. The department has established a three phase project designed to improve our science curriculum and laboratories. Our initial goal was to replace old, decrepit equipment and begin steps toward having an exceptional laboratory and enhanced curriculum. The secondary phase or goal is to improve upon the basics and fill in gaps. The third step will be to make our science program one of the elite programs in the state. This is something that all three teachers in our science faculty truly believe in, and we will accomplish this with hard work, conviction, and grant funding for equipment and supplies.

Our current technology use deals with hands-on applications of our curriculum. In our opinion, this is how we can get students involved and excited about their learning. We currently have three electronic balances which help with data collection and move Chemistry, Physics, and Physical Science labs along much more quickly. The rollercoaster we have is an amazing addition to our science curriculum, allowing students to explore centripetal force and acceleration, velocity, projectiles, elastic and inelastic collisions, and acceleration due to gravity. The force table is a great way for students to see how vectors actually work. The students get to work with resultants, components of vectors, and equilibrants.

Our magnetic mechanical system is probably one of the favorites of the students in the Physics class. The students get to make their own triple beam balance; and work with components of vectors, inclined planes, friction constants, wheel and axle set ups, force, acceleration due to gravity; and many more applications. This system is very useful because it is easy to change with the magnetic board, and the students become very involved in interactive learning. The ripple tank in our laboratory has been a huge asset for both Physics and Chemistry. It is amazing for students to realize that by using a strobe light at the corresponding frequency to the wavelength in the ripple tank they can measure the wavelength with a ruler because it looks as though the wave has been frozen in time. Our optics system allows us to teach about all aspects of light, wavelength, frequency, lenses, polarity, the colors of light, lasers, refraction, reflection, and so much more. Our students love it, and they have even gone on to develop their own type of sunglasses based on what they have learned.

During the past two years, we have purchased smart timers, which have proven to be an incredible asset to our program. These items are used at least once a week throughout the school year by all the Physical Science and Physics classes. These timers have made our labs much more applicable to real life by allowing us to show students velocity, acceleration, and displacement without the human error of doing hand timing. In fact, we have even incorporated the hand timing into early lessons to show the differences in collecting data and how crucial it is to get the correct measurements.

An upcoming forensics project, which integrates Chemistry, Biology, Genetics, Anatomy and Physiology, and creative writing, is currently the talk of the school. We are putting together a “murder mystery” which will involve collecting “blood,” fingerprints, hair, and other materials. The Biology class will be in charge of collecting biological evidence. The Chemistry class will run qualitative analysis tests on the substances. They will use results from their qualitative lab to help them decipher the information. The students will be using electronic balances, hot plates, and a centrifuge to help them. The Anatomy class will investigate “the body” and collect and analyze fingerprints. The Genetics class will be running DNA analysis on the biological evidence. The students will be using micropipettes and gel electrophoresis to help with the tests.

IMPACT OF TECHNOLOGY IN THE CLASS

As a science department at Salmon High School, we continue to strive to better prepare students for life outside of school. This is a crucial piece of education that is often lacking. We feel that by making our classes more hands-on and using current technology that students will see at college or in the workplace, we will enhance and inspire future learning in the areas of science. This preparation will pay huge dividends for students as they move on to the workplace or further their education. It is critical for these students to get real life applications out of their education so they can realize how important these concepts are. We have seen the impact this can have in numerous ways, including increased test scores, more science electives being offered, larger class numbers, improved mastery performance, and higher numbers of graduates entering science related fields.

Students receive a portion of their grade by attempting laboratory assignments and drawing conclusions based on their data. They do not always get the desired result, but the most important part is being able to draw a conclusion based on the results they get. Oftentimes, this is a concept that is typically not explained to the students. However, Salmon High School students gain hands on experience and can see the importance of the scientific method. This is such a crucial piece to developing a young scientist who will think outside the box.

The students must also show concept mastery of lab skills as another portion of their grade. This begins at the freshman level when students learn lab safety skills and equipment identification, and it continues through their senior Physics class when students are required to produce the correct size loop in order to keep the car on the rollercoaster (centripetal force and acceleration). There are hundreds of these lab skills that must be mastered over the four year period that the students are studying. We feel confident that the majority of students leave our programs with the basic skills to function in a college level science lab.

Since we have started our improvements, we have noticed a large decrease in the number of regular students who fail and in the advanced students who earn a C or below. We have also observed an increase in test scores in class and on standardized tests. On the ACT test given this past spring, our school scored two tenths of a point higher on the science portion than the rest of the state. Our students also scored eight tenths of a point higher than they did on last years test, and the students have been increasing their scores each of the last five years. The students taking advanced science courses scored an average one point higher than the state average.

The number of students taking science courses also continues to rise each year. We have been able to implement new science elective courses due to the large number of students interested in studying science. The new courses include: Genetics, Botany, and Environmental Science. Our numbers continue to rise in our advanced science courses as well. Chemistry has increased from 18 to 38 students, Anatomy and Physiology has grown from 8 to 15 students, and astronomy has grown from 25 to 32 students and from one section to two sections. We believe that offering students more technology is directly related to the growth of these programs.

The last indicator that we have observed that demonstrates technology's impact on our program is a growing number of students pursuing science related fields after they graduate from Salmon High School. From the graduates of 2006 and 2007, we have students majoring in: nursing (4), pre-medicine (2), engineering (6), science education (2), architecture (2), physics (2), radiology (1), dentistry (1), and dental hygiene (3). We realize that students' interests may change as they get older, but we feel that out of one hundred-sixty students, this is a large percentage showing such interest in science.

USING TECHNOLOGY TO ENHANCE LEARNING OPPORTUNITIES

Through this grant, we would like to purchase supplies and equipment to benefit the very large cross curricular forensics unit we will be implementing in the spring 2008. This unit will take about two months to complete. We are culminating all of this information into a final project for the classes involved.

The students from each of the classes involved (Advanced Biology, Chemistry, Genetics, Anatomy & Physiology, Yearbook, and Physics) will look over and investigate the crime scene. Each group will know in advance what they are going to investigate and the evidence they must collect. The students will practice all of their investigative work and evidence collecting before the actual crime. This will be accomplished by purchasing a crime scene investigation kit and two blood refill kits. These kits, along with classroom and teacher supplements, would be used to practice investigating prior to the crime. We would also learn how to test blood and be able to use the blood for our victim and the criminal. Each class participant must show mastery of the skill they are working on before the real crime will be committed.

At that point, the lead instructor will plant the body and evidence at the school. First the Yearbook class will be called in to photograph the crime scene. These will be digital photographs which will be downloaded to the teacher's computer and saved on our school network. This way all the classes involved will be able to look back on the crime scene photographs. We could also then show these on the new multimedia projector we would like to purchase with this grant. Then the students from the other classes will be notified and do their jobs during the time of their scheduled class. The students will also be notified that it was a high school faculty member that committed the crime.

The next step would be for the classes to run their tests on the evidence collected. The Biology class must look at all hair and fibers using the new microscopes to determine their origin. The Chemistry class will analyze substances found on the scene and check the chemical makeup. This could be done with the purchase of a spectrophotometer and computer software which could also be used all year long in Chemistry, Physics, Botany, and Physical Science. These results could then be presented to all the classes using a new multimedia projector.

The Anatomy and Physiology class will collect fingerprints and compare them to fingerprints from the faculty. This process requires the purchasing of two fingerprinting kits. The kits will allow us to practice in advance, collect fingerprints at the scene, and fingerprint the faculty. The Physics class will look at bullet trajectory to figure out where the assailant was standing and the angle of entry of the bullet. This job could be accomplished using the two lasers which we have in the lab already. The Genetics class will analyze any DNA evidence and run gel electrophoresis on it. The test results will be compared to information collected from faculty members. A DNA Biotechnology Lab System would be crucial to this project. The centrifuge from this kit could be used for Chemistry, Botany, and Anatomy and Physiology. The micropipettes could be used for several different class projects. The entire contents of this kit could be used in Genetics, Biology, Botany, Anatomy and Physiology, and Chemistry classes.

Finally, the students will find the criminal based on their scientific conclusions. These conclusions will be written up by each class and then combined into one complete report. This will be done using email between the classes. The report will also include crime scene photos and any evidence that was collected. A copy of all the data collected will be given to the creative writing teacher. The students will then be asked to write up their version of what happened and why it happened. The steps of the project will be videotaped. Video clips, the final report, and pictures will be displayed at the Academic Awards Banquet held in the spring.

USING TECHNOLOGY TO CREATE INNOVATIVE LEARNING

One of the first projects that we would like to accomplish through this grant would be teaming up with a junior English class and examining viruses. The English class could read The Andromeda Strain by Michael Crichton, written in 1969. This would coincide with our unit in Genetics on viruses and bacteria. We would learn about how both of these can transform very easily. We would do this by working with a colony transformation kit and the electrophoresis equipment. The students will observe the phenotypic effect of adding new DNA sequences to living bacteria. We could then delve into the current research on antibiotic resistance and "super bugs." The students would see E. coli cells take up an antibiotic-resistant gene and gain the ability to grow with ampicillin present. The students would also become virus hunters to be able to identify a viral strain that is responsible for a potentially deadly outbreak. Students would load the "viral samples" and run a gel electrophoresis. The students would then compare them to the known virus fingerprints. Students would also do a research project on emerging diseases. This unit would be wrapped up by watching the 1971 film Andromeda Strain.

The next unit my Genetics class would work on is biotechnology. This unit will include genetically engineered crops and cloning. The Cummings Ranch, operated by the University of Idaho and located in Salmon, Idaho, will be a great resource for this unit. We will be visiting this facility and learning about their genetically engineered crops. We will also be learning about the cloned mules the University developed. Classes will then be putting in time at the ranch's research center helping with their cattle project and learning how genetics figures into making the best calf for production reasons. The students would be working on a lettuce cloning project in the classroom as well. This unit would culminate in a debate based around whether genetically engineered foods are good or not, taking into account everything we have studied.

A great new project to tie together the Chemistry and Health classes would be a toxicology unit. This unit would involve thin-layer chromatography and the use of a spectrophotometer to investigate and demonstrate state-of-the-art drug screening techniques. This would entail investigating the most commonly abused drugs, both-over-the counter and illegal. The illegal drugs are simulated by the kits we would like to purchase. The Health teacher would go over specifics on each drug and new research. In Chemistry, students would see how drug screening occurs and learn why these drugs are so harmful based on their makeup.

Aside from these projects, there are some supplies which could be used continuously by every science class. These items would include hot plates, electronic balances, and a vacuum pump. With this grant, we would be able to place a hot plate and an electronic balance in every science room in our high school. Being able to use these balances correctly is a basic skill that needs to be mastered to succeed in several areas, including college science courses, pharmacies, and even grocery stores. The vacuum pump set up is an excellent way to show Boyle's, Charles', and the combined gas laws. Our laboratory also has a dire need for new Bunsen burners. This laboratory is used for all classes needing Bunsen burners for any laboratory procedure, and would improve the overall safety of students. The last piece of equipment that would improve our classrooms would be a multimedia projector. We would use this projector to show information to our classes and to allow the students to make presentations to the classes.

The primary focus of this Qwest Foundation grant request is to help achieve phase two of the Salmon High School Science Department's improvement plan and to establish a solid foundation for implementing phase three. Our science faculty has worked hard to make the present improvements and is committed to building one of the strongest science education programs in the State of Idaho.

Qwest Foundation for Education Grant Expenditure Plan
(Standard IFARMS Budget Format)

Activity	100 Salaries	200 Benefits	300 Contractual Agreements	400 Materials and Supplies	500 Capital Objects	**TOTAL**
Blood Refill Kit (2)				$24.00		$24.00
Crime Scene 1 Investigation Kit				$83.25		$83.25
Fingerprinting Kit (2)				$119.00		$119.00
Deluxe DNA Biotechnology Lab System				$3825.00		$3825.00
Spectrophotometer				$859.99		$859.99
Spectrophotometer computer software and cable				$85.00		$85.00
Hot plates (3)				$619.65		$619.65
Electronic balances (2)				$896.00		$896.00
Vacuum pump and compressor				$415.00		$415.00
Vacuum tubing				$15.50		$15.50
Bunsen burners (15)				$224.85		$224.85
Bunsen burner tubing (13)				$154.57		$154.57
Colony transformation kit				$128.95		$128.95
Intro to toxicology kit (2)				$404.00		$404.00
Basic lettuce cloning kit				$56.15		$56.15
Outbreak! Fingerprinting Virus DNA kit				$86.95		$86.95
Andromeda Strain Book (25)				$199.75		$199.75
NEC VT695 projector				$949.99		$949.99
Shipping & Handling				$839.80		$839.80
TOTAL	$0	$0	$0	$9987.40	$0	$9987.40